

# How Important are Ornamental Cultivars in Species Invasions?

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# Many Non-native Species Have Become Invasive in the US



- Accidental introduction
- Erosion control
- Cattle forage
- Human consumption
- Horticulture

UGA0002156

# Horticulture is a Pathway of Invasive Plant Introductions

*Reichard and White (2001)*

- **Majority of woody invasives introduced for horticultural purposes**
  - 82% of 235 woody plant species used in landscaping
  - 3% distributed for soil erosion control (and as ornamentals)
- **Pathways of introduction:**
  - Botanical gardens and arboreta
  - Nurseries
  - Garden club and horticultural society seed exchanges
  - Seed trade industry
  - Others – herbal plant exchanges, aquarium plants, soil erosion control





by jöki 2004



# Ornamental Plant Development

Many of the same traits identified in invasive/weedy species also desired by gardeners and thus selected by plant breeders:

- **Prolific flowering**
- **Rapid growth**
- **Wide ecological tolerance**
- Reliable pollination with **high fruit production**  
(for wildlife)

Not desired:

- **Frequent seed dispersal** (messy)

Many successful invasions are associated with **Multiple Introductions**

e.g. European sparrow, starling

Commercial distribution of cultivars of a species!



# Cultivar

= A variety of a plant species intentionally selected for desirable characteristics and maintained through cultivation, often for the purpose of commercial distribution.



**Cultivated  
Variety**

# Callery Pear (*Pyrus calleryana*)



Bradford





# Callery Pear (*Pyrus calleryana*)



Bradford

**All propagated by grafting  
to create cloned trees**

**Each cultivar consists  
of clones of the same  
genotype**



Aristocrat



Capital



Autumn Blaze



Redspire  
Trinity  
Princess  
New Bradford  
Valzam  
Whitehouse  
Holmford  
Pzazz  
Paradise  
Jaczam  
Jillzam  
etc.

Cleveland  
Select  
(Chanticleer,  
Faurie, Stone Hill)

# Cultivar Origin

- Sports (somatic mutations) propagated clonally
- Clones of multispecies or multicultivar hybrids
- Seed selections of inbred lines that breed true

*Knight et al. 2011*

Usually the cultivar itself does not invade...

**The offspring invade!**

Especially if cultivars originate as sports or are hybrids, their offspring will NOT be true to type

**So wild offspring may not resemble parents**



# So How Can Cultivars Contribute to Invasive Plant Problems?

- Not much is known about this in many species
- We often do not know what is actually spreading into natural areas or how often this occurs

## Burning Bush (*Euonymus alatus*)



Southwestern OH



Caesar Creek Gorge, OH



# So How Can Cultivars Contribute to Invasive Plant Problems?

I) **Cultivars do not have any influence** on plant invasions

II) **Individual cultivars directly invade natural areas**

III) Because of traits related to weediness, **cultivars contribute to general propagule pressure**, and disproportionately so because of widespread commercial distribution

IV) **Cultivars can hybridize** with one another, parental species, or related species to produce seed

# Individual cultivars directly invade natural areas

- Often considered less likely because cultivars are adapted to cultivation (need care to survive)



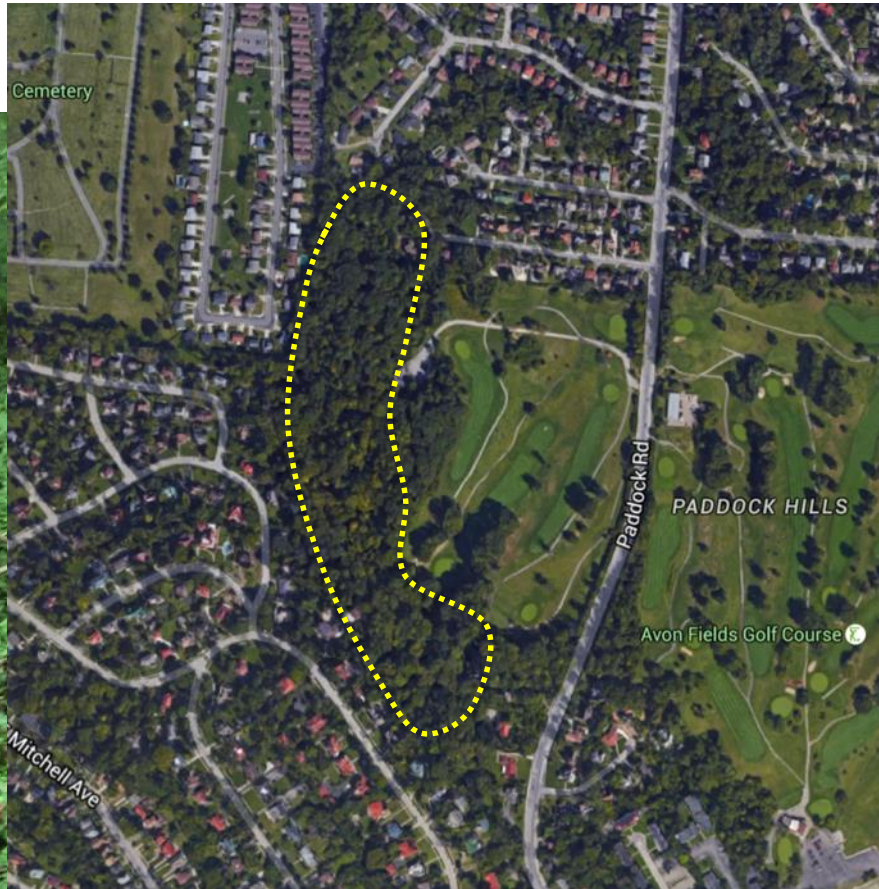
- But may occur with vegetative spread within a local scale (vines such as vinca, wintercreeper)
  - Spread from a homesite

# Winter creeper (*Euonymus fortunei*)



# Winter creeper (*Euonymus fortunei*)

Avon Woods, Cincinnati, OH

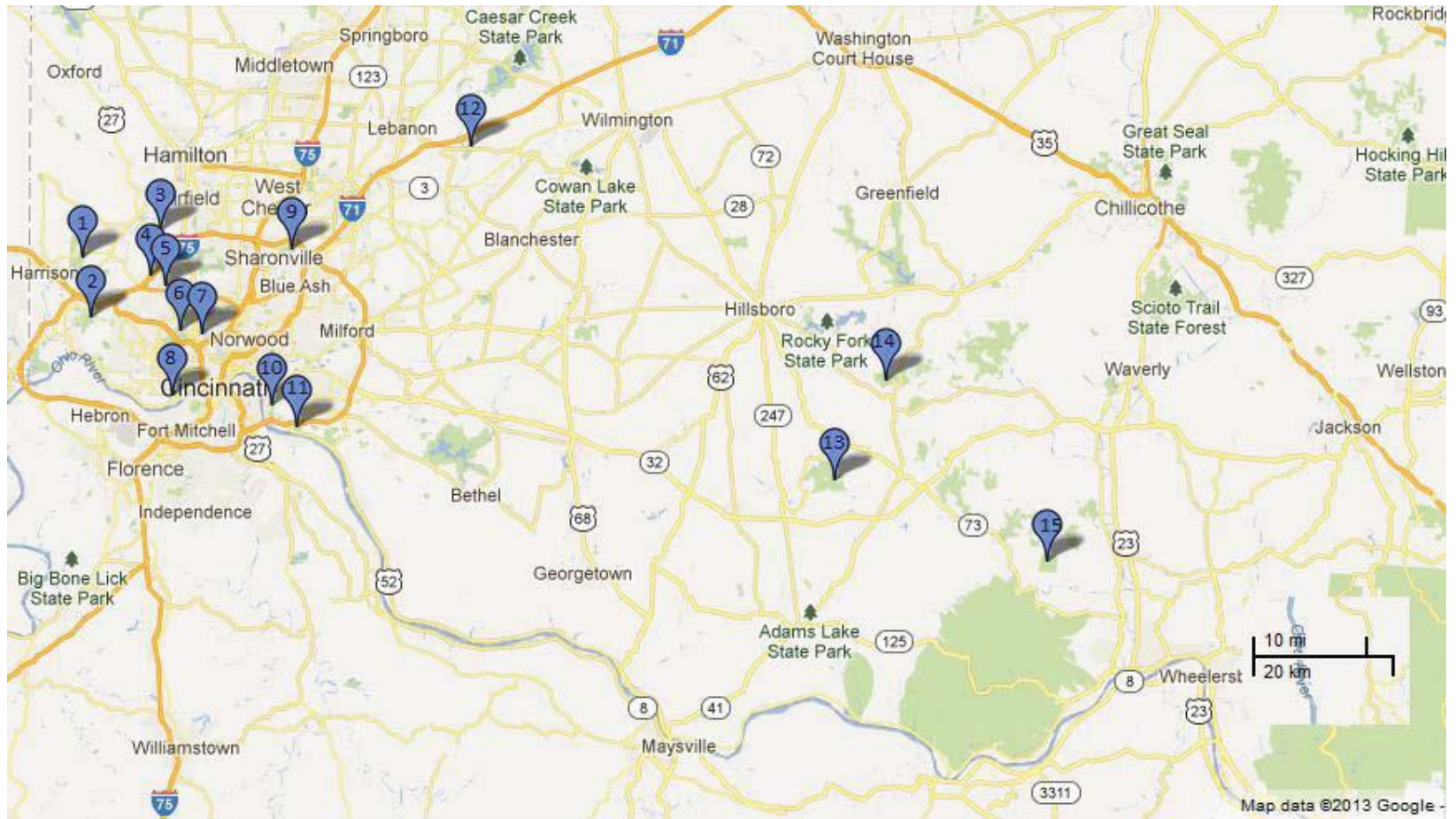


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© Denis Conover



# Winter creeper (*Euonymus fortunei*)



Winter creeper also detected in nearly every one of 16 sites across southwestern OH (*Mastalerz & Culley, unpubl.*)

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**Because of traits related to weediness, cultivars contribute to general propagule pressure, and disproportionately so because of their widespread commercial distribution**

**Japanese barberry (*Berberis thunbergii*)**



*But what is spreading from cultivation?*

© U. Mehrhoff

# Percentage of Japanese barberry seedlings with green color:

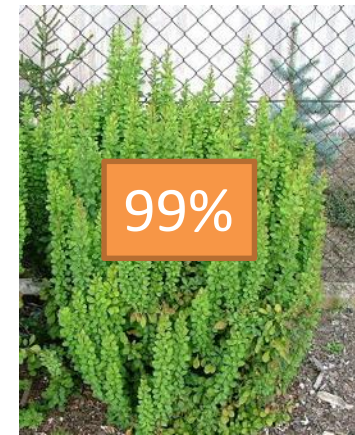
*(Lehrer et al. 2006)*



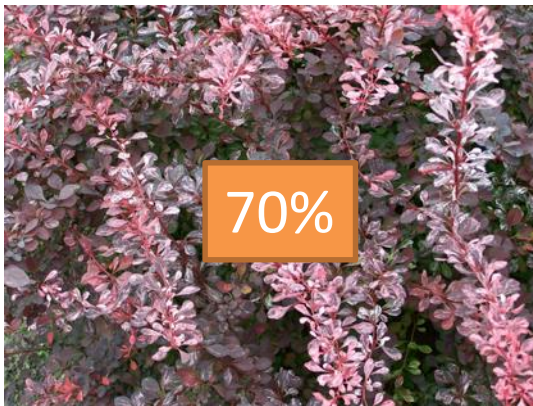
'Crimson Pygmy'



'Aurea'



'Erecta'



'Rose Glow'



'Bonanza Gold'



'Kobold'

- Exposure to low light causes purple-leaved barberry to become green (*Lehrer and Brand 2010*)
- Some cultivars produce more seed than others (*Lehrer et al. 2006*)



'Rose Glow'

>



'Crimson Pygmy'

=



'Aurea'

But.... seed production increases 3-4 yrs after original survey!

- Both green and purple forms can establish in the field (*Lubell and Brand 2011*)
- Genetic study: purple-leaved cultivars can contribute to wild populations (*Lubell et al. 2009*)

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# Cultivars can hybridize with one another, parental species, or related species to produce seed

- Individual cultivar often thought to be sterile (no seed production) or have very low seed production

## Callery Pear (*Pyrus calleryana*)

Butler County Hwy, OH



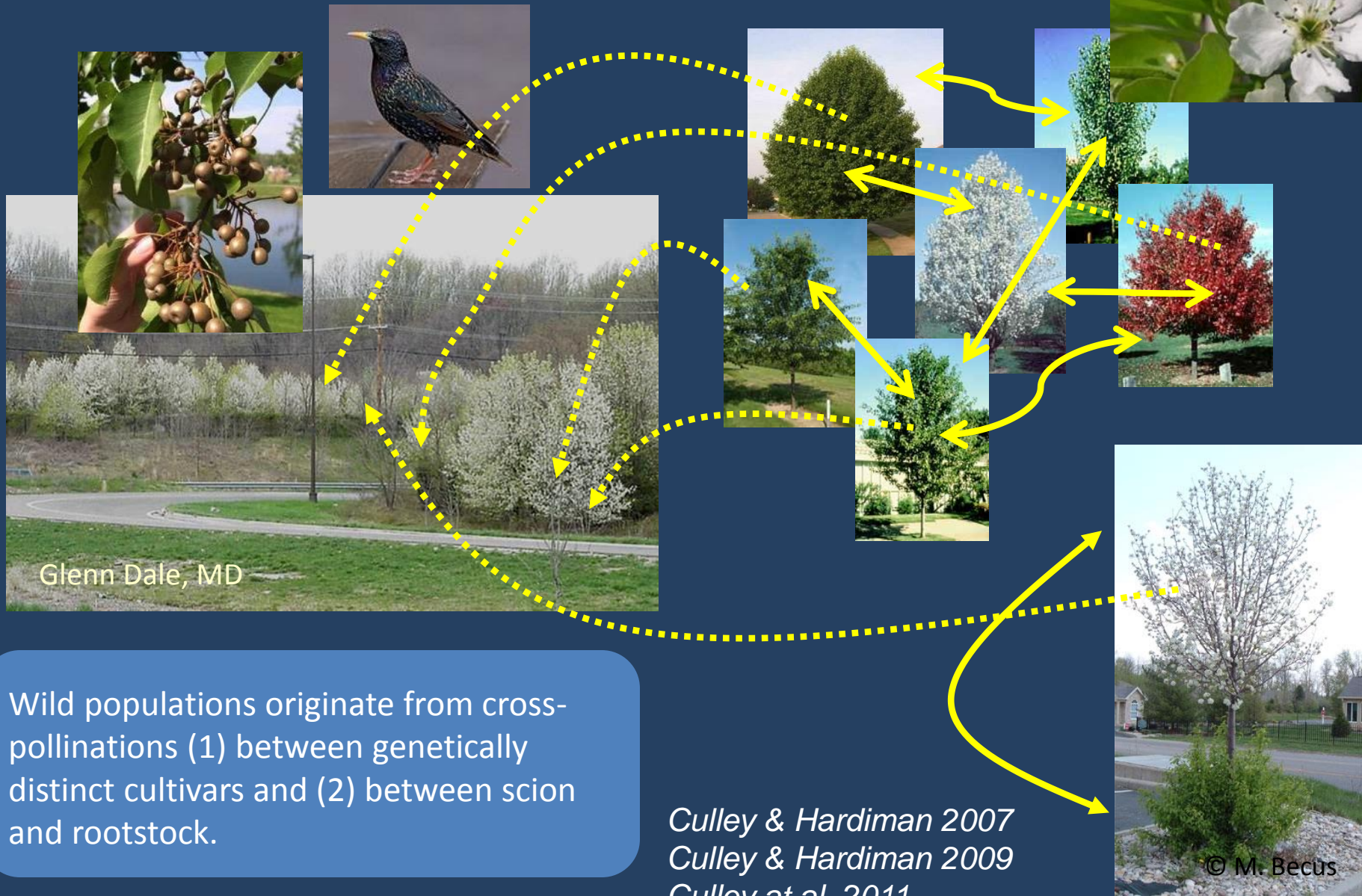
Bradford

Chanticleer

Aristocrat

**Plant is self-incompatible but cultivars cross-pollinate to produce fruit.**

# Formation of Wild Populations



Glenn Dale, MD

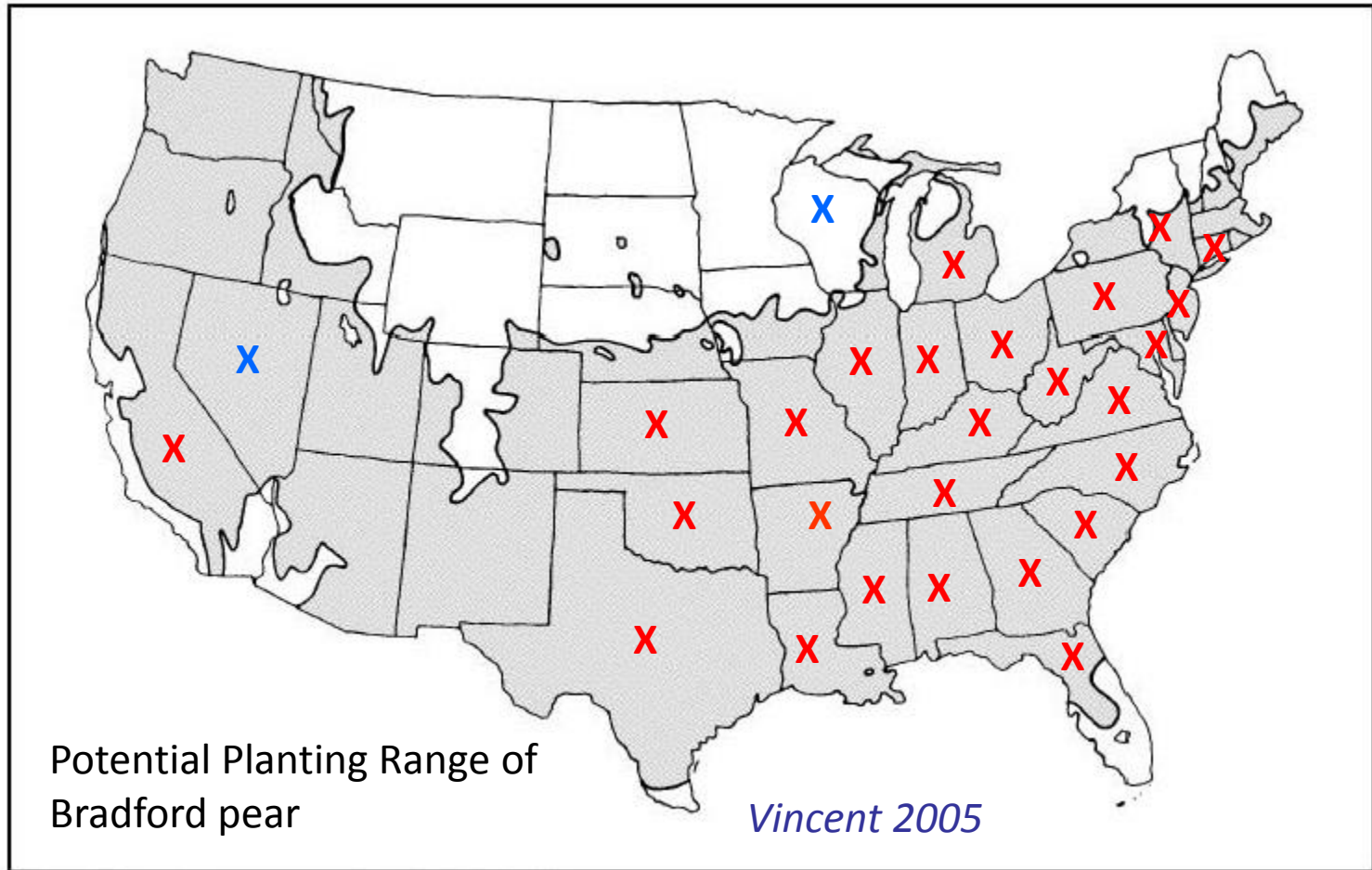
Wild populations originate from cross-pollinations (1) between genetically distinct cultivars and (2) between scion and rootstock.

*Culley & Hardiman 2007*  
*Culley & Hardiman 2009*  
*Culley et al. 2011*

© M. Becus



# Wild Pear Specimens – A Herbarium Study



US Forest Service, Fact Sheet ST-537 (Oct. 1994)

**New cultivars now being developed with improved cold tolerance!**

Recently, wild pear has been observed moving into and persisting in the forest interior.



Forest Invasion in Martin County, IN

**Beginning of spread into a new niche?**

# Purple Loosestrife (*Lythrum virgatum*)

- Often sold as a sterile alternative to the highly invasive *Lythrum salicaria*



'Morden Pink'

*L. virgatum* x *L. salicaria*



'Morden's Gleam'

*L. virgatum* x *L. alatum*  
'Morden Pink'



'Dropmore Purple'

*L. salicaria* x *L. virgatum*

**PROBLEM:** Cultivars of *L. virgatum* can produce seeds if they cross with each other or with *L. salicaria*

## A PROHIBITED NOXIOUS WEED!



*Lythrum salicaria*

**Tested cultivars of *L. virgatum* are NOT sterile in the field.**

- ‘Morden Pink’ x *L. salicaria* seeds have 76% germination (*Lindgren & Clay 1993*)
- ‘Morden Pink’ can cross with *L. salicaria* (51-59% germination)
- Offspring are inter-fertile with both parents and with ‘Morden’s Gleam’ & ‘Dropmore Purple’ (*Amon et al. 2007*)

**They often usually contain *L. salicaria*!**

# **Ornamentals on the Hot Seat**

# Chinese Silver Grass (*Miscanthus sinensis*)

- Popular ornamental grass
- Many cultivars available nationwide
- Potential bioenergy crop



'Gracillimus'



'Morning Light'



'Little Zebra'

# Chinese Silver Grass (*Miscanthus sinensis*)

Kentucky:



© Lauren Quinn

Ohio:



© Lauren Quinn

# Five-leaf Aralia

## (*Eleutherococcus sieboldianus*)

- Rapidly growing, deciduous shrub
- Often used in landscaping

“Extremely adaptable shrub that will grow well in a wide range of soils in full sun to shade conditions. Good tolerance for drought, poor soils, urban pollution and shearing. Promptly remove root suckers to maintain appearance unless naturalizing.”

MOBOT





# Five-leaf Aralia

(*Eleutherococcus sieboldianus*)

- Found in open forests and forest edges
- Very rare in natural plant communities but can quickly outcompete native trees and shrubs

Avon Woods, Cincinnati, OH



# Norway Maple (*Acer platanoides*)



This species is not yet extensive in OH but is rapidly spreading and displacing native maples in the Northeast US, with documented ecosystem effects.

Young infestation in Halifax, Nova Scotia, Canada



# Butterfly Bush (*Buddleia davidii*)



'Boreder Beauty'

- Invasive in Australia
- Spreading from cultivation



'Black Knight'

# Amur Corktree (*Phellodendron amurense*)

- Eastern Asia, now invasive in IL, NY, PA
- Grows in full sun or dense shade
- Dioecious, fruit bird-dispersed
- Escapes ornamental plantings



# What Can Be Done to Reduce or Prevent Cultivar Contributions to Plant Invasions?

- Need to **engage the nursery industry** and promote consumer education!



# What Can Be Done to Reduce or Prevent Cultivar Contributions to Plant Invasions?

- Need to **engage the nursery industry** and promote consumer education
- **MIPN: Invasive Plants in the Trade Working Group**
  - How do we define what is acceptable?*
  - “Sterile”
  - “Highly reduced fertility”
- **Arboreta & Botanical Garden Early Detection Program**
  - Different organizations joining MIPN effort
  - Symposium proposed for the American Public Garden Association 2016 conference in Miami, FL

## **“PEAR TREE MAINTENANCE**

Pear trees on the land between the sidewalk and the street must be maintained and kept trimmed so as to allow the free passage of pedestrians on the sidewalk and cars or other vehicles in the street. It is the homeowner’s responsibility to replace any dead pear trees with a Cleveland Select pear tree. All replacement trees must be at least 3” in trunk diameter.”

**UPDATE:** Homeowner’s Association recently decide to promote other trees!



# Acknowledgements

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And all other members of  
the MIPN Plants in the  
Trade Working Group

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<http://www.oipc.info>

